Triaxiality in neutron-rich Tc and Rh isotopes

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Shape coexistence and shape transitions are of current physics interest for neutron-rich nuclei with Z > 40, N > 58. Study of triaxiality in this region has drawn much attention. $g_{9/2}$ proton and $h_{11/2}$ neutron orbitals are involved and their interplay results in rich structure characteristic of various nuclear shapes including triaxiality.

So far not much is known about the odd-Z nuclei in this region. High spin level schemes of ^{105,107,109}Tc (Z = 43) and ^{110,111,112,113}Rh (Z = 45) are proposed in present work based on fission-gamma data accumulated with Gammasphere in 2000. Bands built on various proton orbitals including K = 1/2 intruder orbitals and band crossings related to $h_{11/2}$ neutron-pair breaking are observed.

Triaxial-rotor-plus-particle model calculations performed with $\varepsilon = 0.32$ and $\gamma = -22.5^0$ on the prolate side of maximum triaxiality yielded the best reproduction of the excitation energies, signature splittings and branching ratios of the Tc isotopes. Also the calculations gave the best fit to those of the Rh isotopes at near maximum triaxiality with $\gamma = -28^0$. See Fig. 1 and 2 for reproductions for the excitation energies of ^{113}Rh and ^{107}Tc, respectively.

The side band built on an excited $11/2^+$ with low excitation energy predominantly feeding the $9/2^+$ of the yrast band also provides evidence of triaxiality. The E2 strength is mainly dictated by the diagonal E2 reduced matrix element, which vanishes for $\gamma = -30^0$.
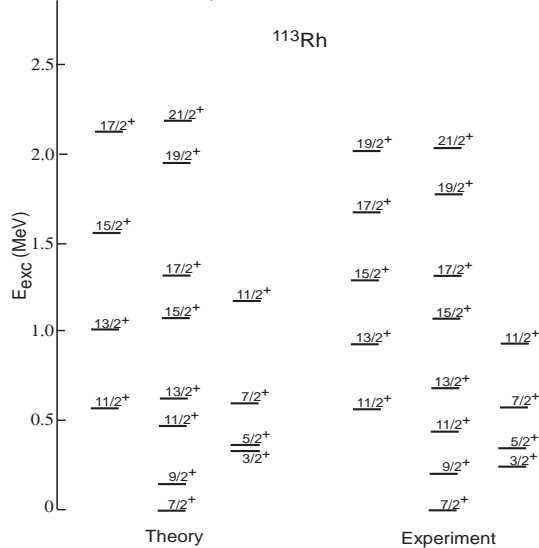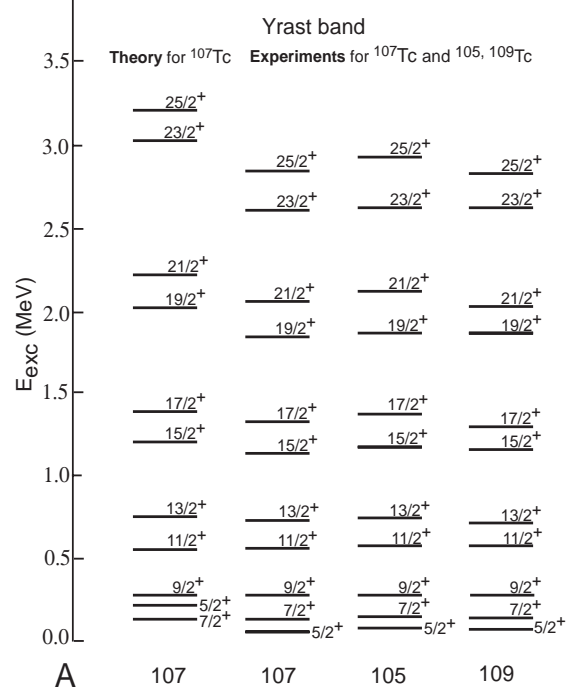

FIG. 2: Comparison of triaxial - rotor - plus - particle model calculations for the yrast band of ^{107}Tc with experiments of Tc isotopes.

REFERENCES

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FIG. 1: Comparison of triaxial - rotor - plus - particle model calculations for the positive-parity bands of ^{113}Rh with experiments.